



Armed Forces College of Medicine AFCM



Male Genital System

II

(Interstitial cells and genital ducts)

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INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

- 1- Describe the microscopic structure (LM & EM) of Leydig cells.**
- 2- Correlate the microscopic structure of Leydig cells to their function.**
- 3- Describe the microscopic structure of intratesticular and extratesticular (epididymis, vas deferens) duct system**
- 4- Correlate the microscopic structure of the epididymis and vas deferens to their function.**
- 5- Interpret the microscopic changes in epididymis and vas deferens in different diseases**

Lecture Plan



1. Part 1 (5 min)
2. Part 2 (35 min)
3. Part 3 (5 min)
4. Lecture Quiz (5 min)

Sperm production (Spermatogenesis)

Sperm production (spermatogenesis) includes:

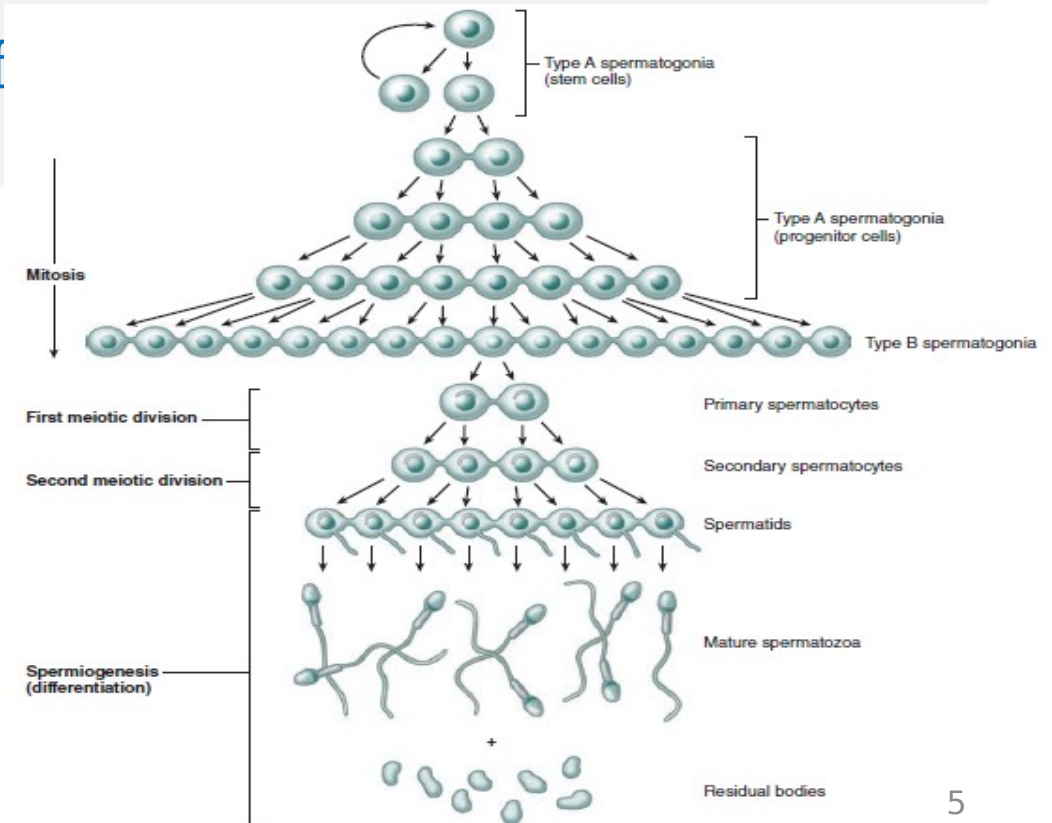
1. Spermatocytogenesis: Formation of spermatids from spermatogonia

Including **mitosis** of spermatogonia and **meiosis** (1ry&2ry meiotic divisions)

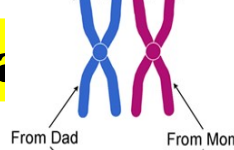
2. Spermiogenesis: Spermatids differentiate into spermatozoa

Spermatogenesis

- Begins at puberty
- Under control of FSH
- Lasts about 2 months

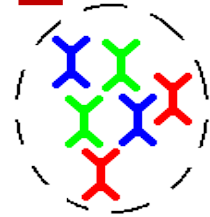


46 chromosomes in the form of **23 pairs**

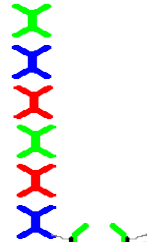


Mitosis

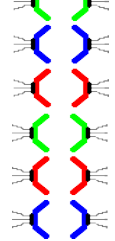
Prophase



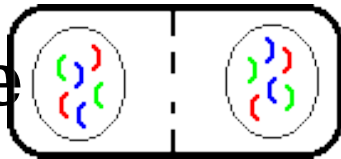
Metaphase



Anaphase

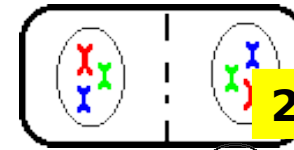
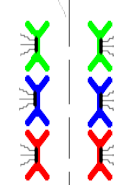
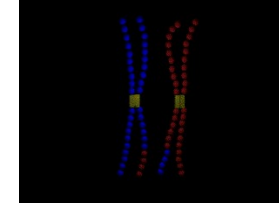
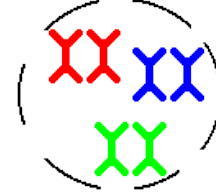


Telophase

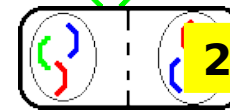


46 s-chromosome

Meiosis



23 d-chromosomes



23 s-chromosomes

Mi**T**osis: each daughter cell ends up with **Two** complete sets of chromosomes

Meiosis



Meiosis includes 2 successive cell divisions: 1st & 2nd meiotic division

(46 d-chromosomes)

First meiotic division

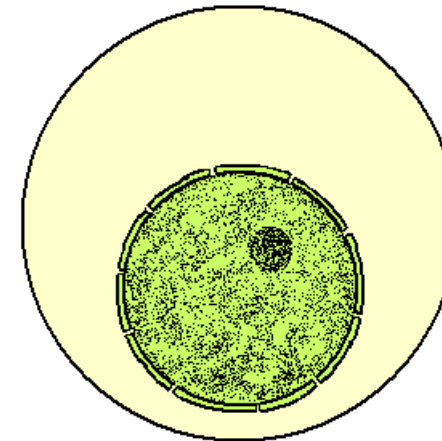


**Secondary
spermatocytes**

23 d-chromosomes

**Secondary
spermatocytes**

23 d-chromosomes



Second meiotic division



Spermatid Spermatid Spermatid Spermatid

23 s-chromosomes 23 s-chromosomes 23 s-chromosomes 23 s-chromosomes

Meiosis



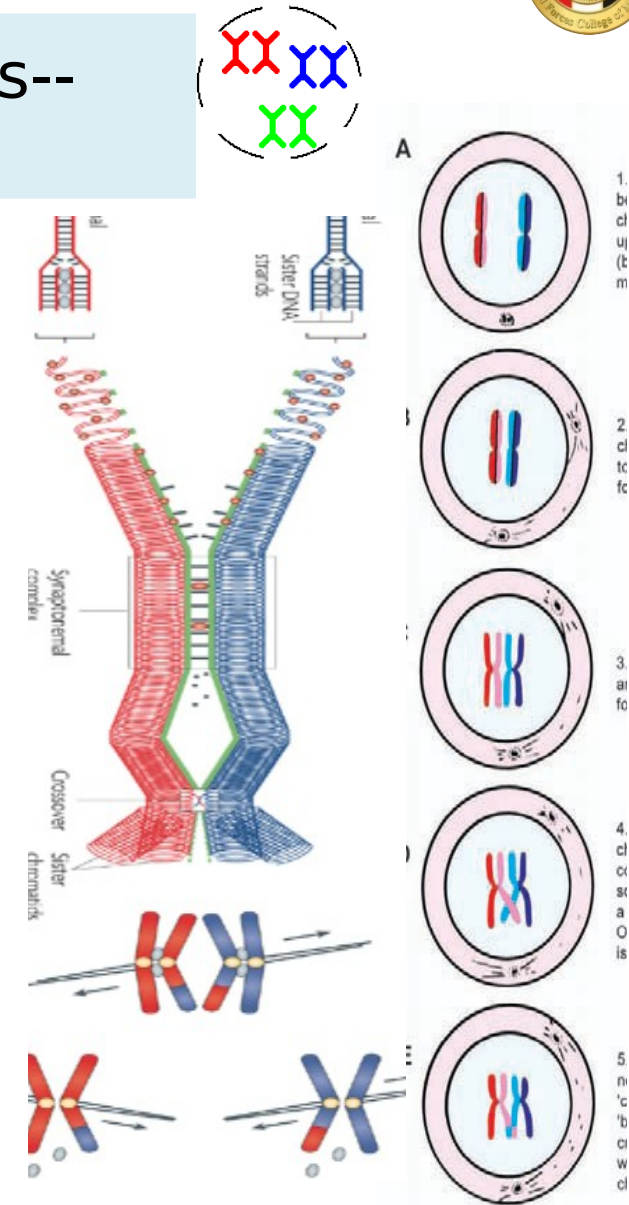
S phase---each chromosome is of 2 sister chromatids--
46d-chromosomes



➤ First meiotic division:

1. Prophase I:

- **Prolonged** (22 days).
- Chromosomes become **thicker & shorter**.
- The 2 chromosomes of each pair (23 pairs) come together & form **synapsis** with formation of **synaptonemal complexes** between the 2 chromosomes where DNA---DNA exchanges (**Crossing Over**) between the maternal and paternal chromosomes



Meiosis



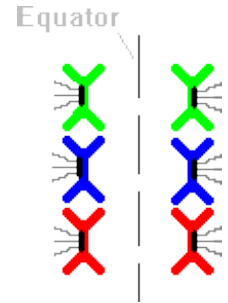
2. Metaphase I:

The 46 d-chromosomes become attached to the spindle at the equator in pairs.



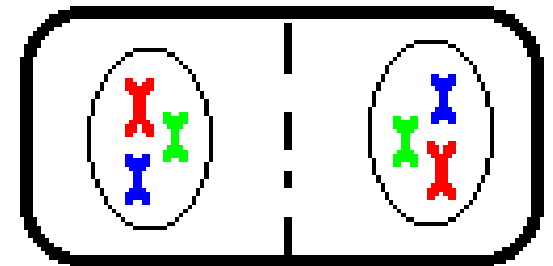
3. Anaphase I:

- No splitting** of the chromosomes
- One entire chromosome** of each pair move to each pole of the spindle



4. Telophase I

- Cleavage occurs
- The resulting daughter cells have **23 d-chromosomes** (each chromosome is formed of 2 chromatids).



Meiosis



➤ Second meiotic division

Not preceded by S phase. It is

similar to mitosis.

❑ Metaphase II:

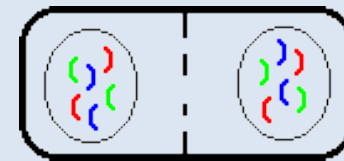
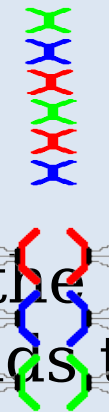
Chromosomes lie up the equator, the kinetochore attach to the spindle.

❑ Anaphase II:

2 chromatids of each chromosome **split** at the centromere followed by migration of chromatids to opposite poles.

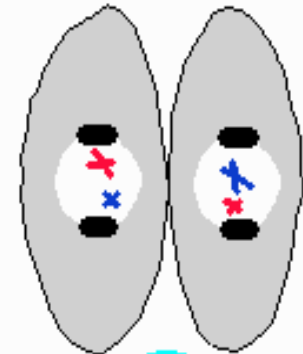
❑ Telophase II:

Results in **2 cells**; each containing 23s chromosomes.



Meiosis II

2N



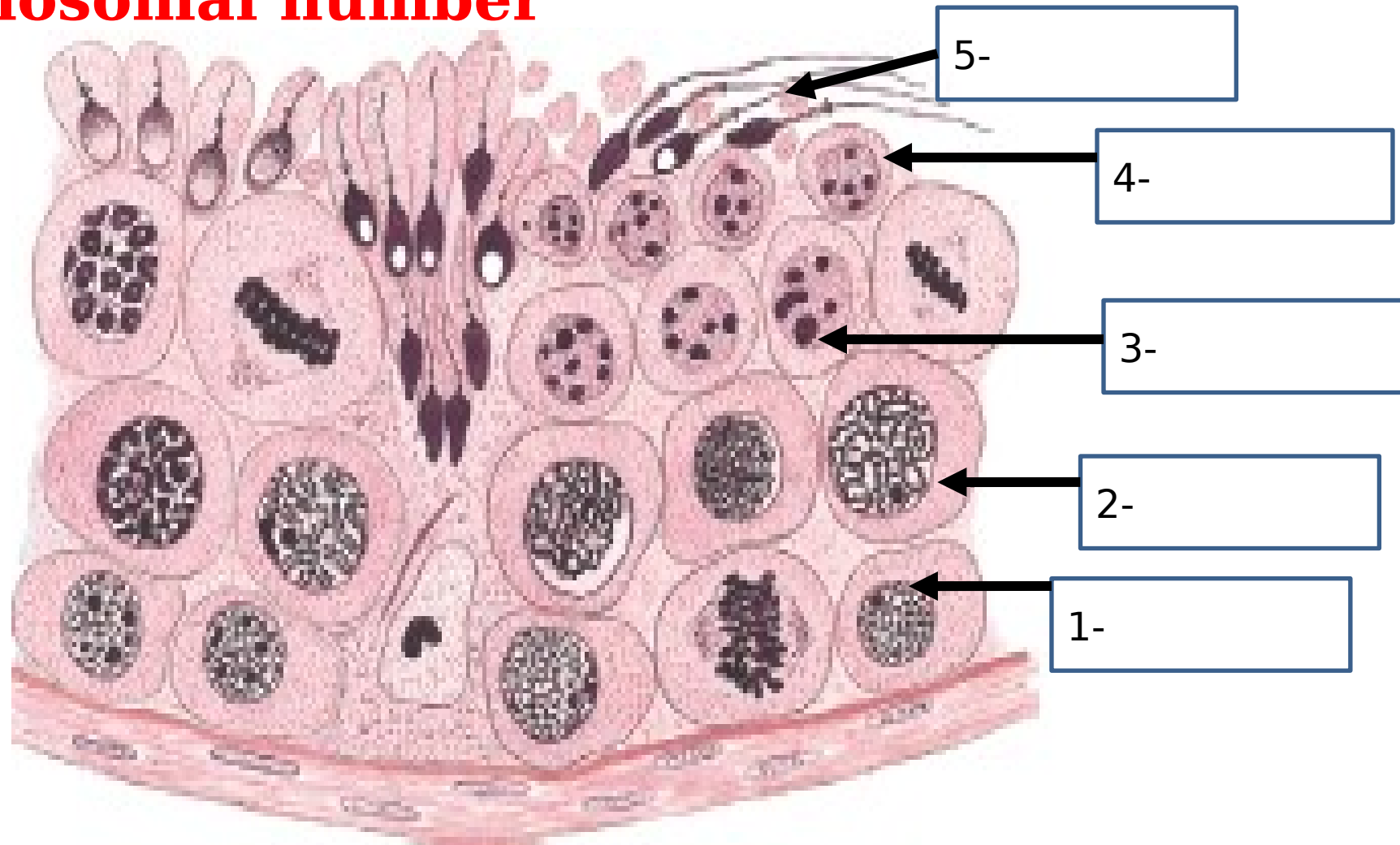
C

ch contains

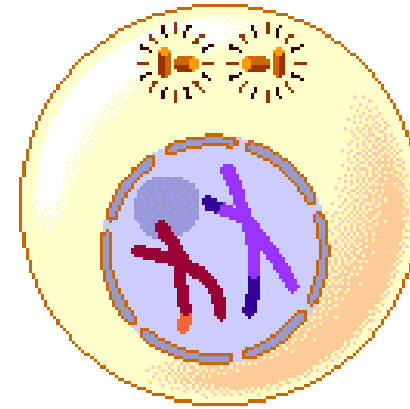
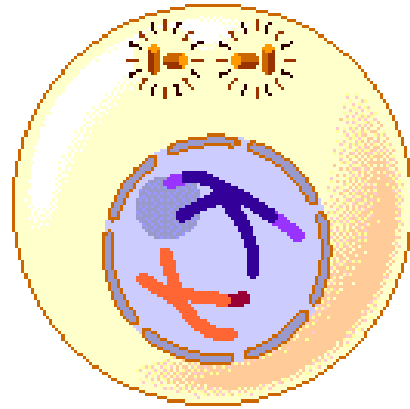
Quiz



Label the cells with mentioning their chromosomal number



Quiz



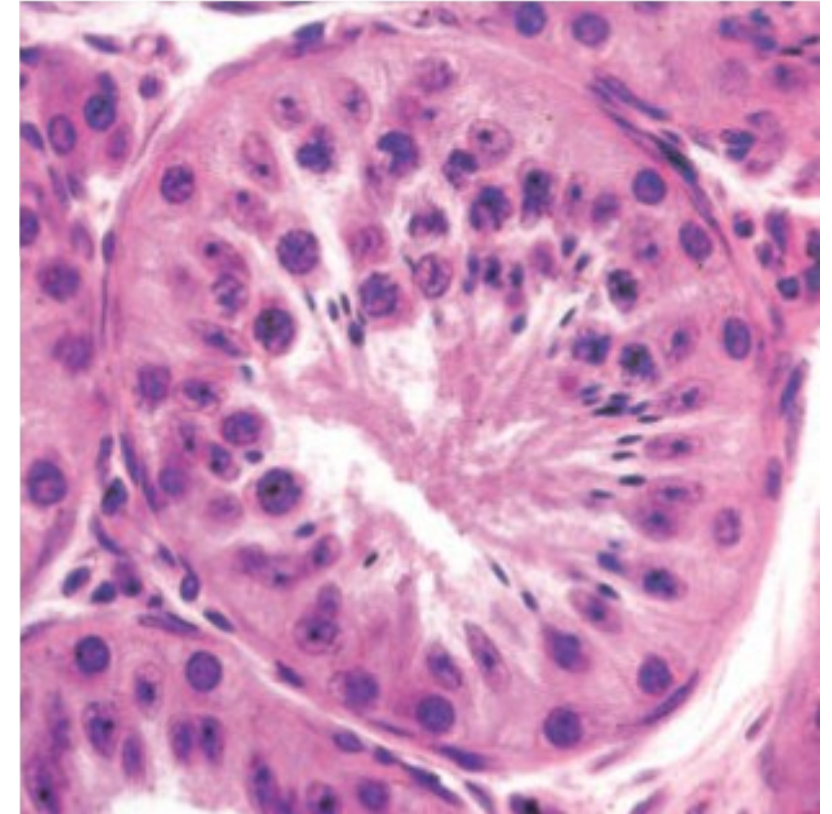
Which division?

Interstitial tissue of the testis



The spaces between the seminiferous tubules within a lobule contain sparse C.T. containing:

- ❑ **Fenestrated capillaries,** lymphatics, nerves, fibroblasts, mast cells, macrophages,
- ❑ **Interstitial cells of Leydig.**



Interstitial cells of Leydig



➤ **Site:** between seminiferous tubules

➤ **LM:**

- **Shape:** rounded polyhydral, present singly or in groups

- **Cytoplasm** pale acidophilic vacuolated rich in

➤ **lipid** droplets.

- **Nucleus** single central rounded vesicular

- Abundant smooth ER

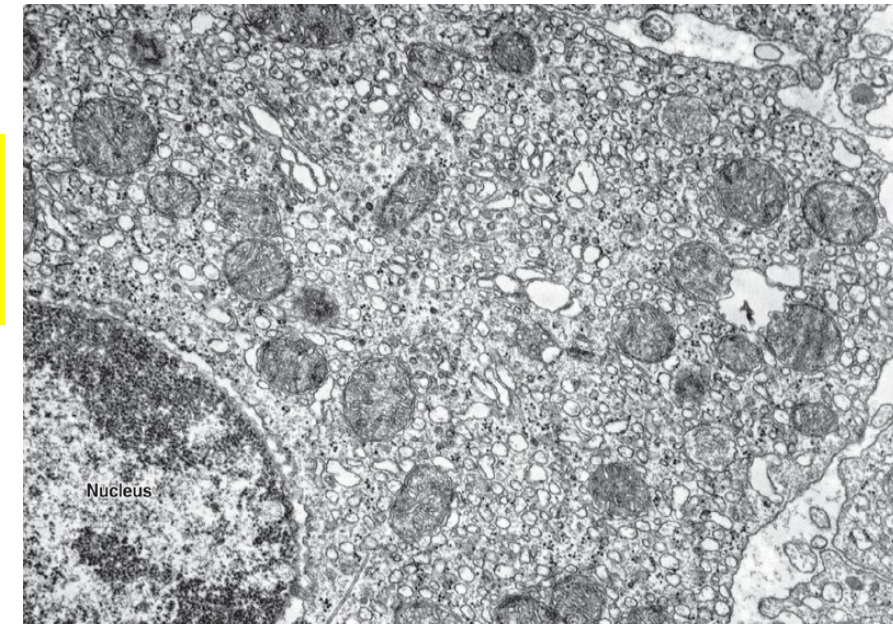
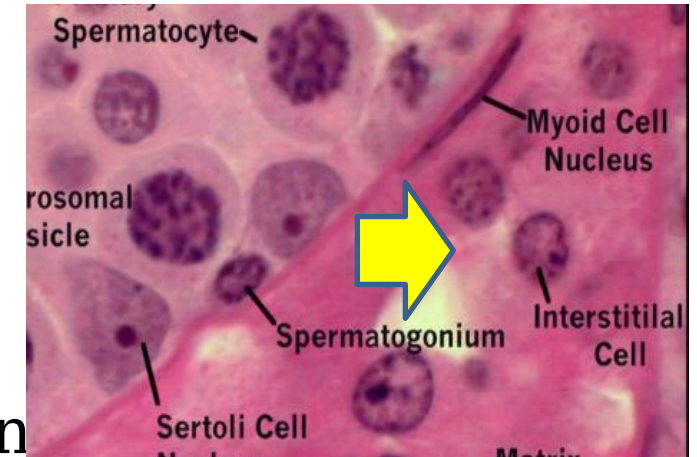
- Mitochondria with tubular

- Golgi apparatus

- Numerous lipid droplets

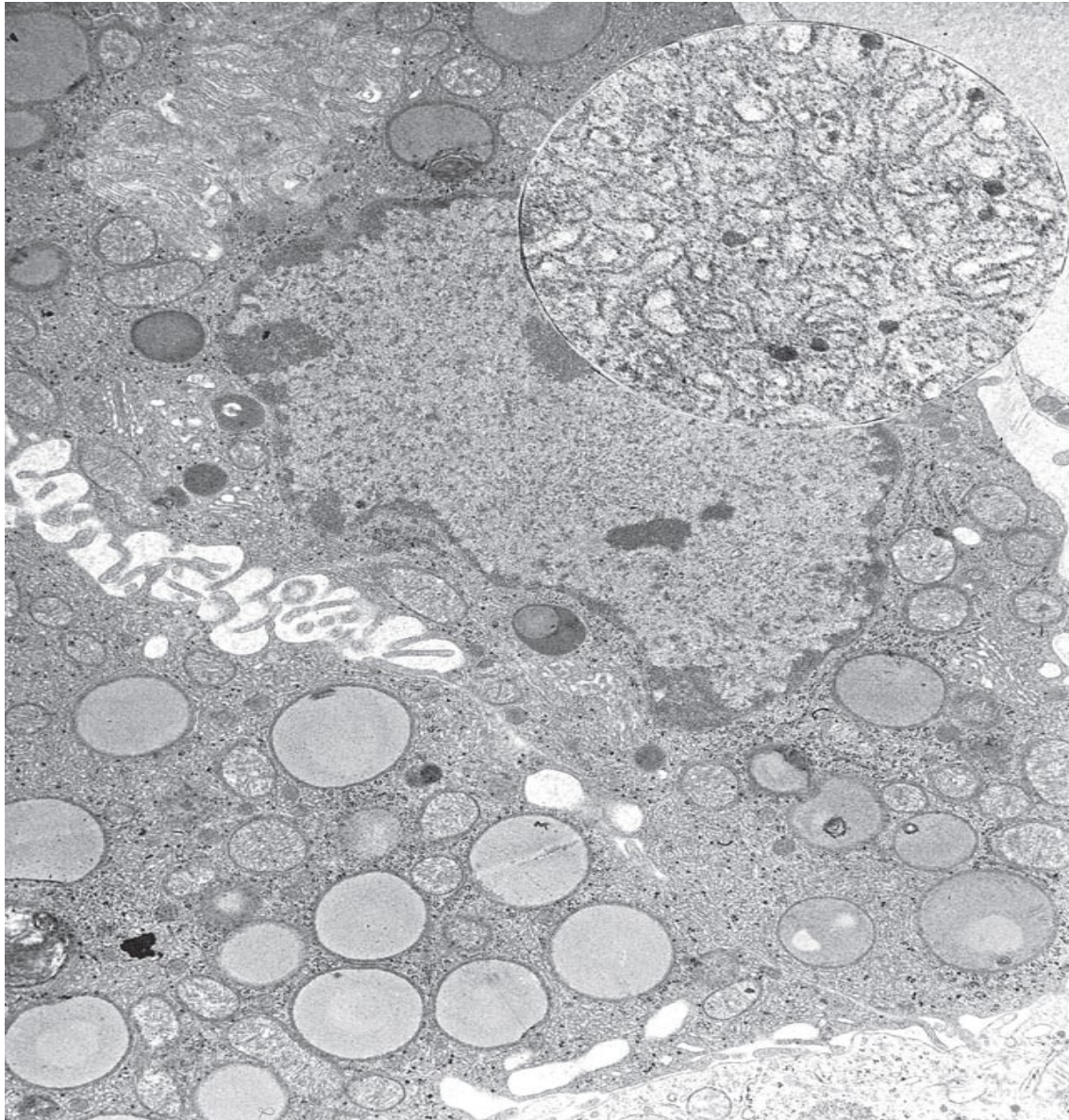
Lysosomes, peroxisomes, some rER
Lipofuscin pigments especially in older men

characters of steroid producing cells.



No secretory granules because the cells secrete without storage of their production

Interstitial cells of Leydig



Crystals of Reinke are inclusions formed of crystalloid protein and they are a **characteristic of the interstitial cells of Leydig.**

➤ **Functions:**

Secretion of **testosterone under control of LH** from Gonadotrophs.

Testosterone is important for spermatogenesis, male sex characters.

Male reproductive system



1- **Testis** (sperms & testosterone)

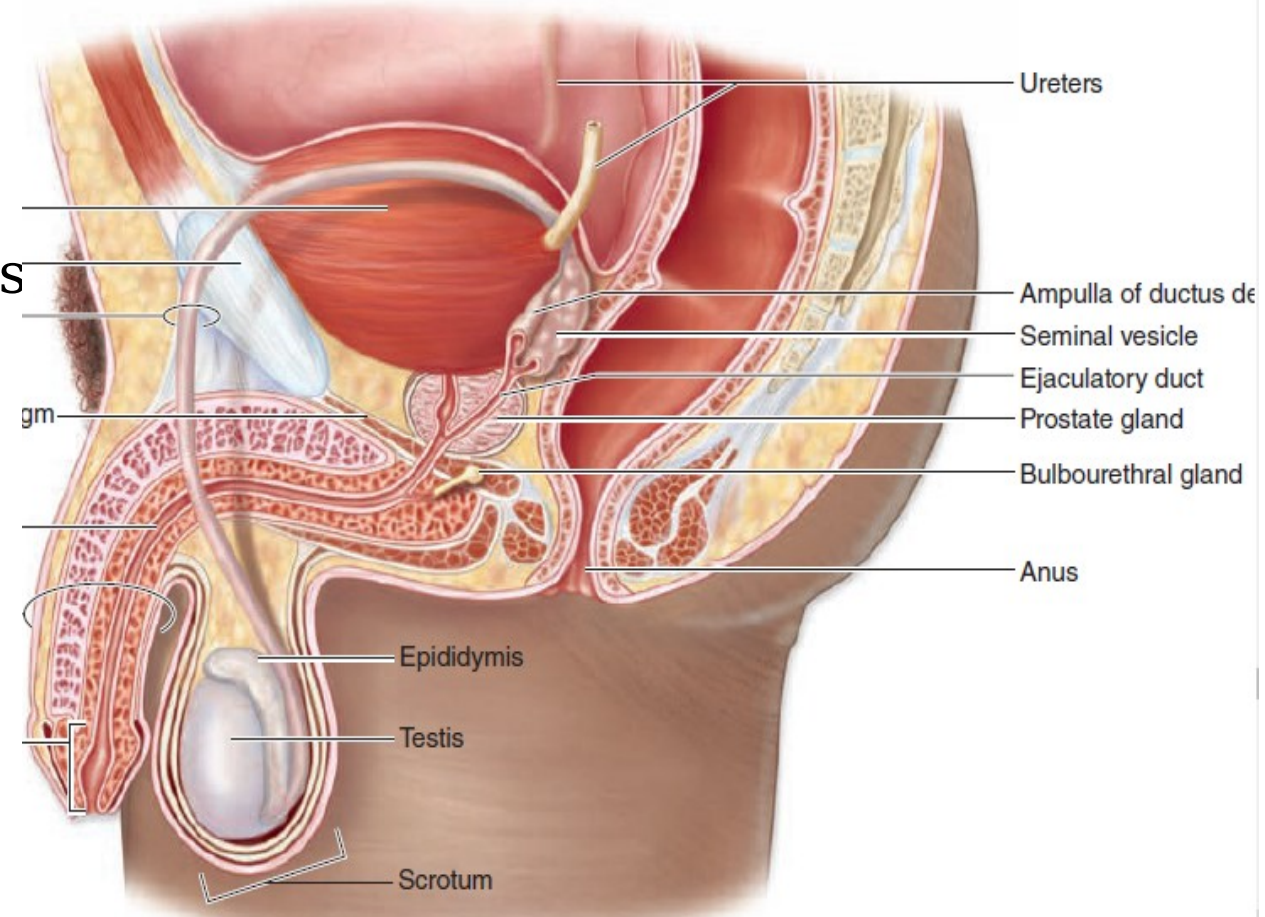
2- **Duct System**

- 1- Straight tubules
- 2- Rete testis
- 3- Efferent ductules
- 4- Epididymis
- 5- Vas deferens

3- **Accessory organs**

4- **Penis**

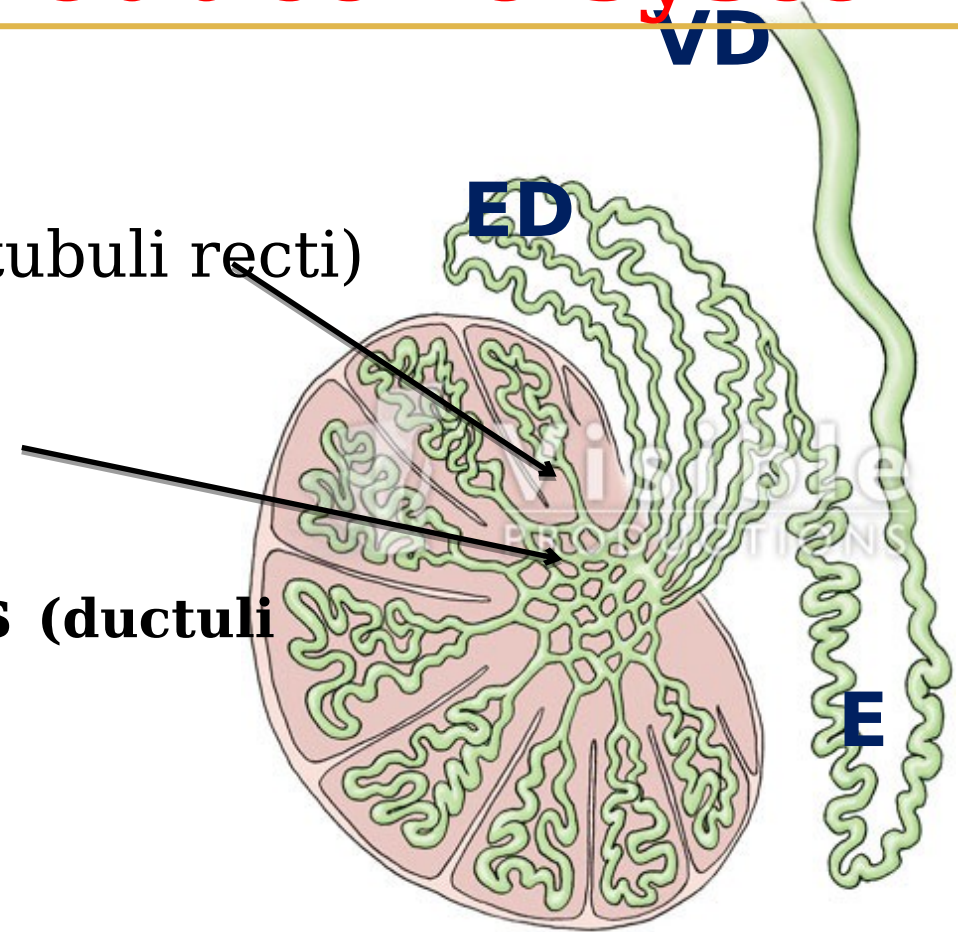
- 1- Prostate
- 2- Seminal vesicles
- 3- Bulbourethral gland



Ducts of the male reproductive system



- Intratesticular**
- 1- **Straight tubules** (tubuli recti)
↓
 - 2- **Rete testis**
↓
 - 3- **Efferent ductules** (ductuli efferentes)
↓
 - 4- **Epididymis**
↓
- Extratesticular**
- 5- **Vas (ductus) deferens**



Ducts of the male reproductive system



- Straight tubules: (Tubuli recti)

Lined with **Sertoli cells**

2- Rete testis:

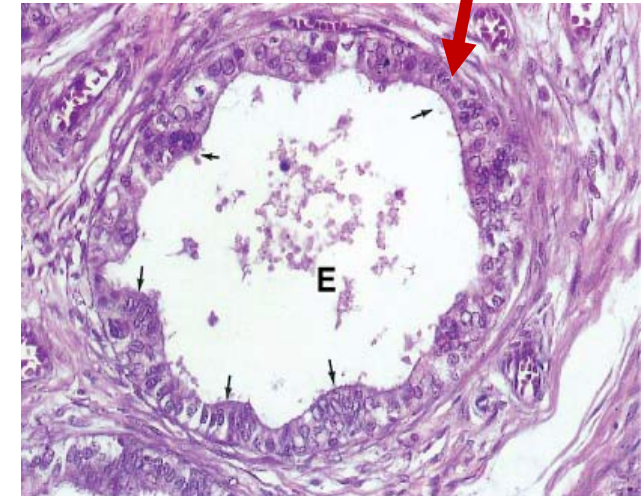
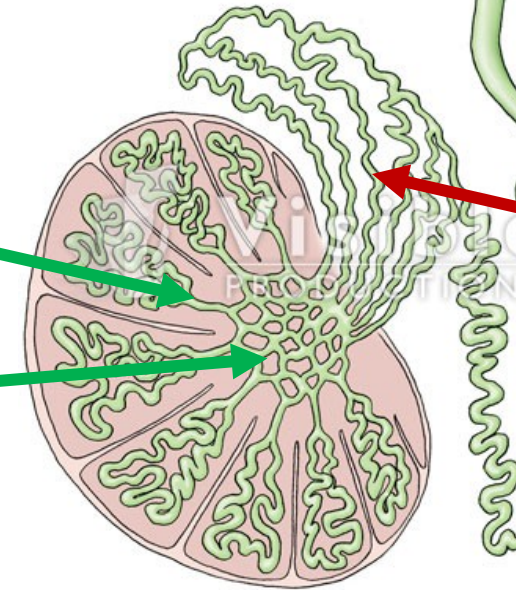
Interconnected network of channels
lined by

3- Simple cuboidal cells. (**Ductuli efferentes**)

- About 20
- Lined with groups of **non-ciliated cuboidal cells**

(**Absorb most of fluid secreted by Sertoli cells**)

- Alternate with groups of **taller ciliated columnar cells**



Ducts of the male reproductive system;

Epididymis



4- Epididymis

- a. **Head:** entrance of efferent ductules.
- b. **Body:** highly coiled single tube
- c. **Tail**

➤ LM:

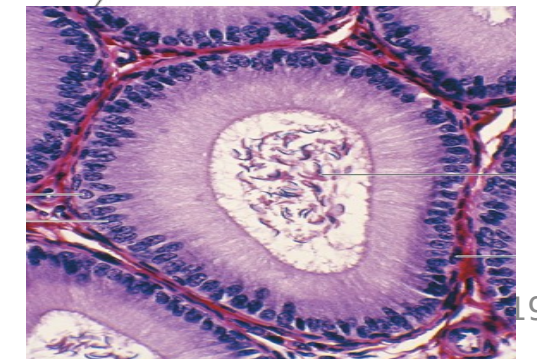
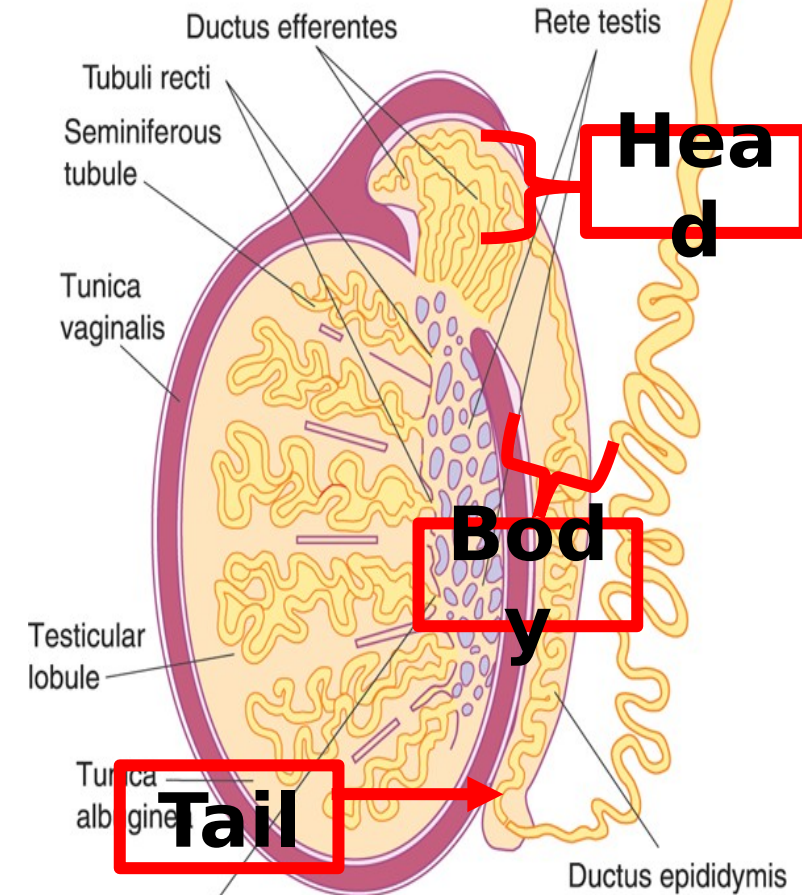
- **Wide lumen** and **thin wall**.
- **Lining ep.: Pseudostratified columnar epithelium**
 - o **Principal cells:** tall columnar cells have **non-motile stereocilia**.
 - o **Basal cells:** as stem cells

➤ EM:

- RER, lysosomes, prominent Golgi complex.

Lamina propria

Circularly arranged smooth muscle fibers that



Ducts of the male reproductive system;

Epididymis



➤ Functions of epididymis:

1. **Absorption of water, excess fluid** (about 90% of the testicular fluid).
2. **Remove residual bodies.**
3. **Secretion of proteins, glycoproteins, exosomes.**
(Role in maturation and motility of the spermatozoa)

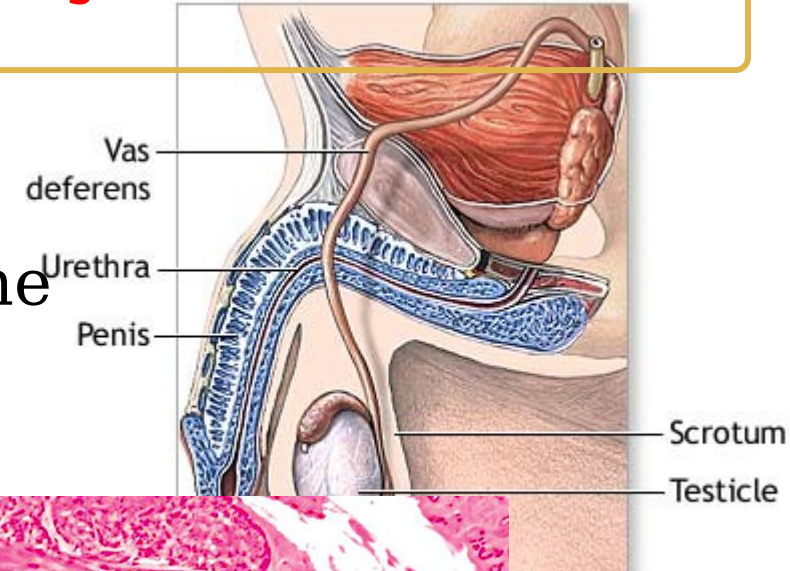
Changes in spermatozoa while passing through the epididymis include:

1. **Development of competence for forward motility.**
2. **Reorganization of the cell membrane surrounding sperm head, by addition “decapacitation factors”, which block the acrosomal reaction, a key event in fertilization.**

Ducts of the male reproductive system; Vas deferens

5. Vas deferens (ductus deferens)

- **Site**: It extends from the tail of epididymis to the prostatic part of urethra.
- **Shape**: a narrow irregular lumen, a **thick muscular wall**

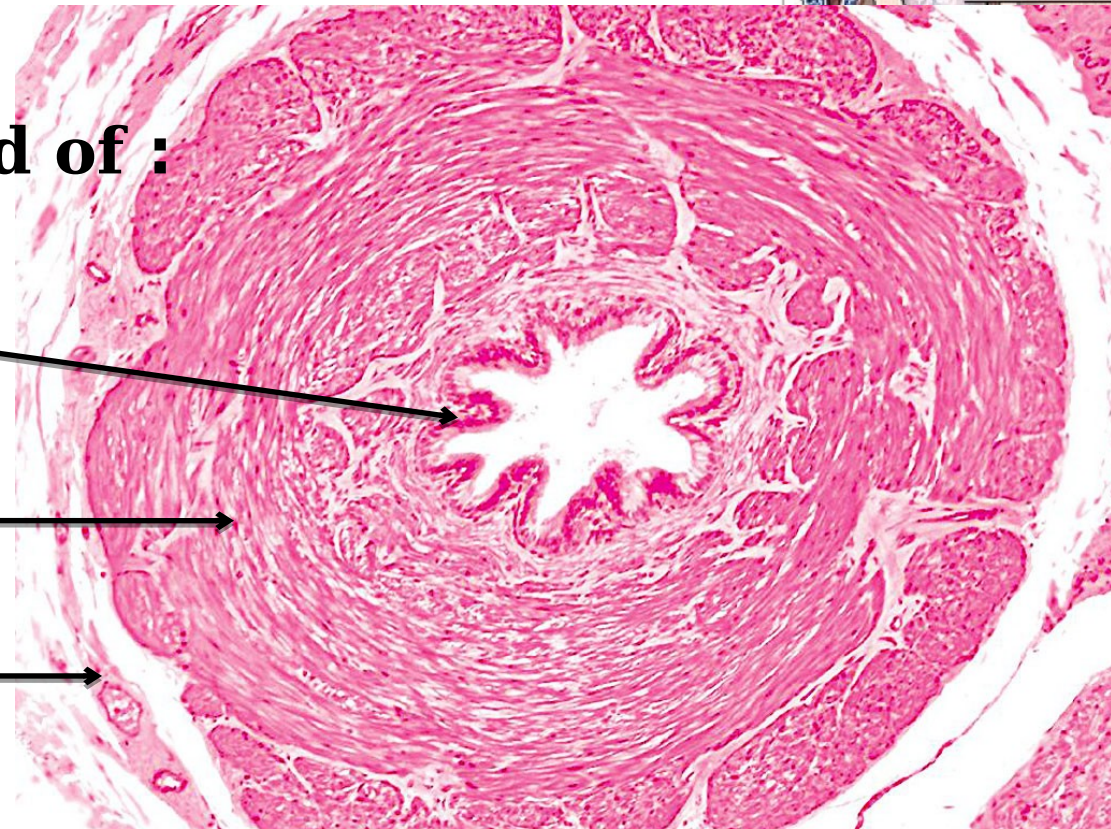


Wall of vas deferens is formed of :

1- Mucosa

2- Muscle layer

3- Adventitia



Ducts of the male reproductive system; Vas deferens



1. Mucosa:

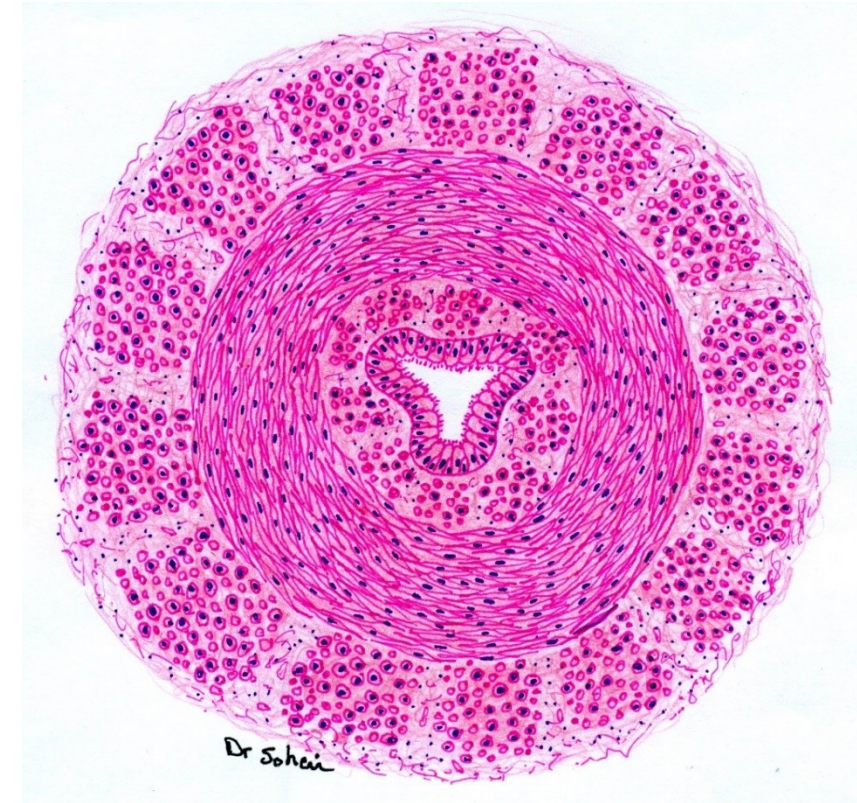
- a) **Epithelium:** pseudostratified columnar epithelium with few stereocilia.
- b) **Lamina propria** of loose C.T. rich in elastic fibers.

2. Musculosa:

very thick layer of smooth muscle fibers arranged as:

- a. **Inner longitudinal.**
- b. **Middle circular.**
- c. **Outer longitudinal.**

3. Adventitia: formed of loose C.T.



Function:

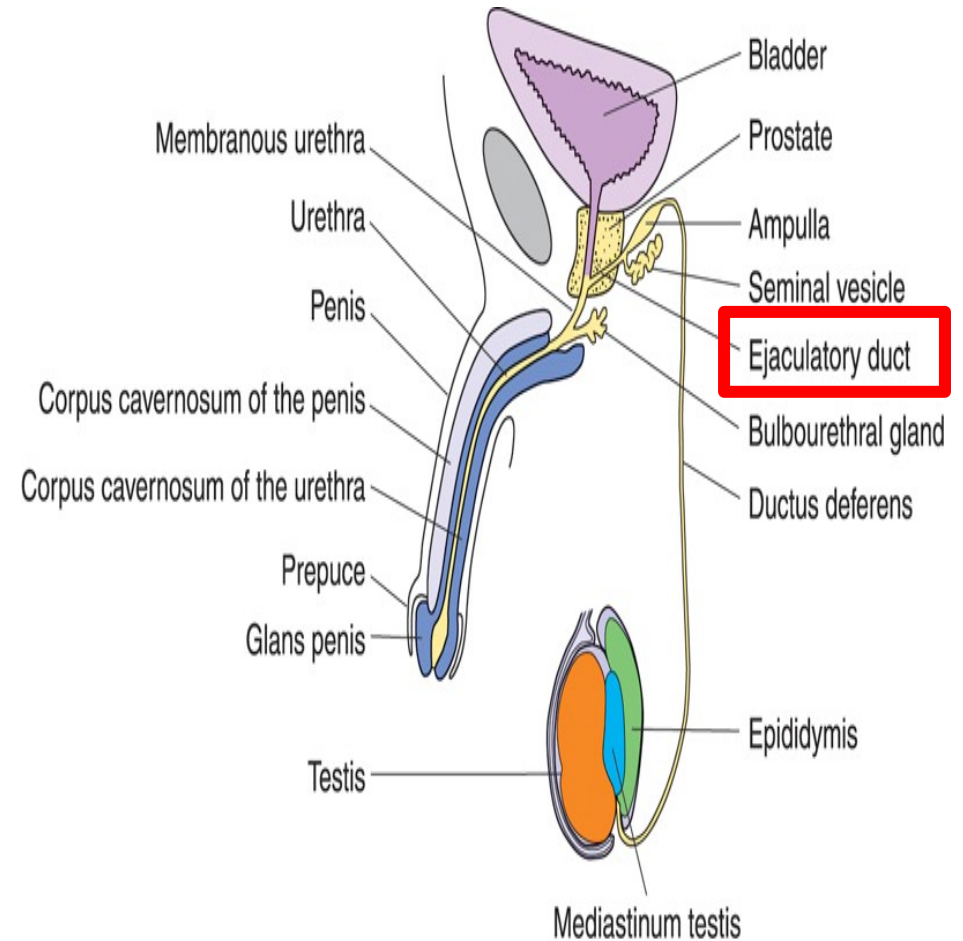
Pushes sperms to urethra during ejaculation by **contraction of the muscle** in its wall.

	Vas Deferens	Ureter
Length	45 cm	Longer
Diameter	3 mm	Wider
Lumen	Very narrow, folded	Wider, more folded
Mucosa	<ul style="list-style-type: none"> ➤ <u>Pseudo-stratified columnar</u> with stereocilia ➤ Narrow layer of loose C.T. contain b.v., nerves, lymphatics, elastic fibers 	<ul style="list-style-type: none"> ➤ <u>Transitional</u> epithelium ➤ Wide layer of loose C.T. contain b.v., nerves, lymphatic
Musculosa	Thicker , well developed	Thinner, less developed
a	Both contain <u>inner long., thick middle circular & outer long. layers of sm. m.</u> (upper 2/3 of ureter, inner circular & outer long.)	
Covering	By spermatic fascia containing bl.v.	Partially covered with peritoneum



6. Ejaculatory duct

- Each ejaculatory duct is formed by union of **ampulla of vas deferens** with **duct of seminal vesicle**.
- It empties into prostatic urethra.
- It is lined with **simple columnar epithelium** surrounded by C.T.
- There is **no muscle** in wall.



Spermatic cord



- **Formed by:**

1. **Vas deferens.**

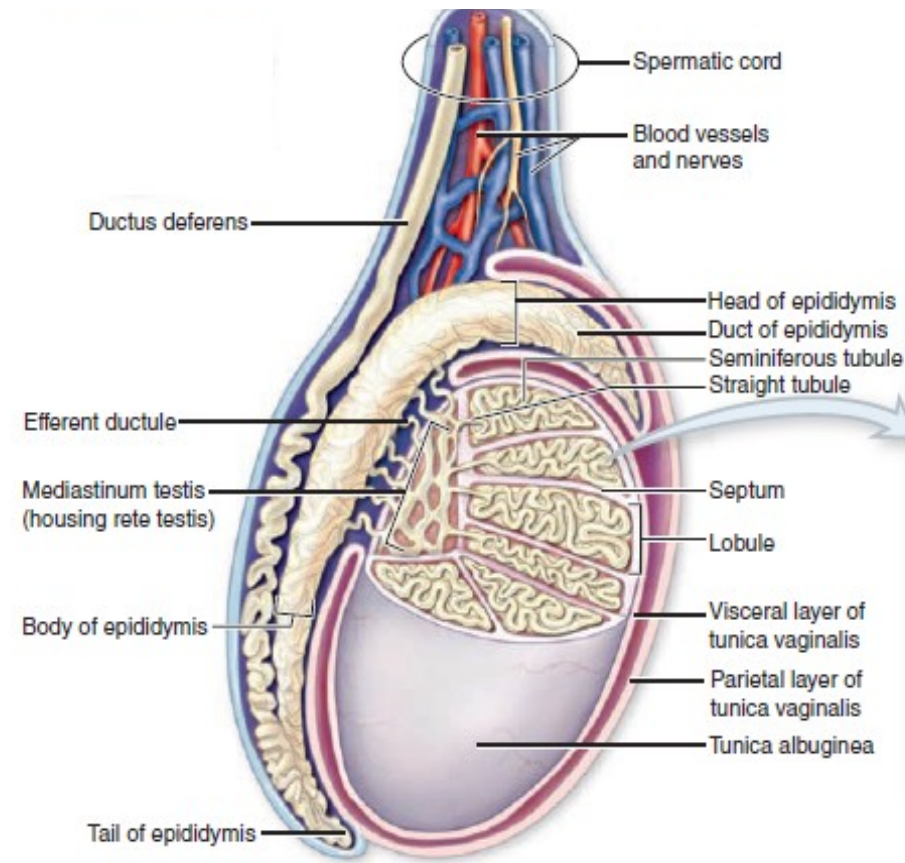
2. **Pampiniform plexus of veins that wind around vas.**

(Allows **heat exchange** between the blood vessels and helps maintain the testes at a lower temperature)

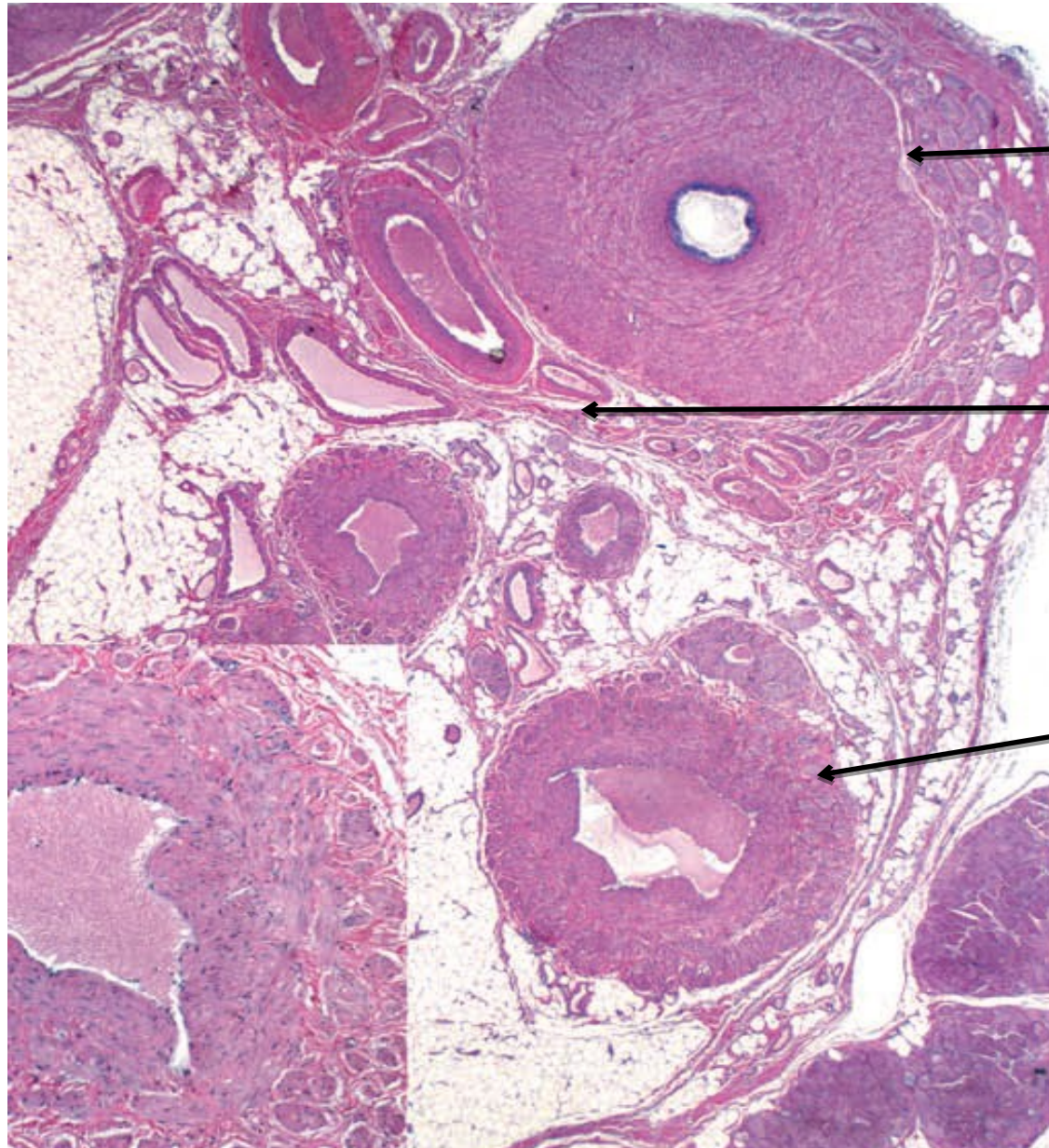
3. **Testicular artery & vein.**

4. **Nerve fibers.**

5. **Cremasteric muscle. Involuntary striated**



Spermatic cord



Vas deferens

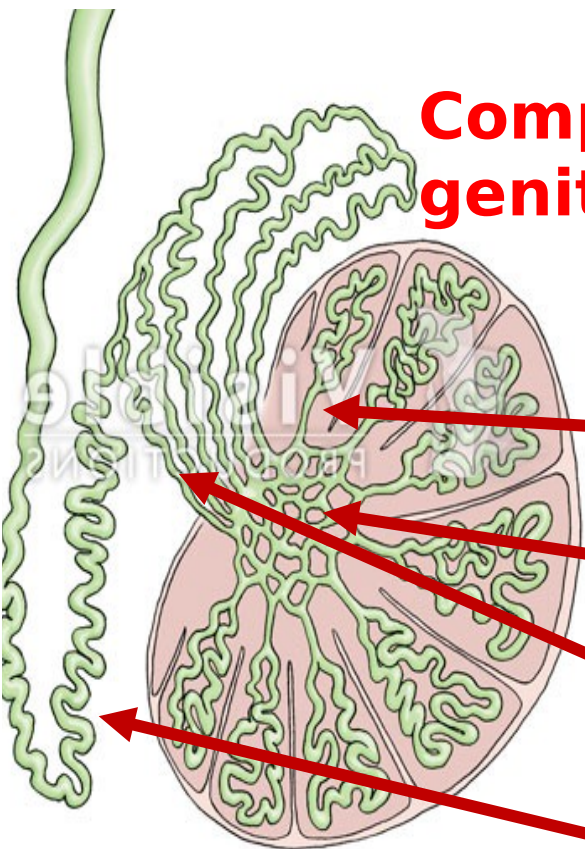
Pampiniform plexus of veins

Testicular artery

Lecture Quiz

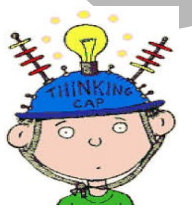


Compare between the different parts of male genital duct system.



	Epithelium	Surroundin g muscle	Function
Tubuli recti			
Rete testis			
Efferent ductules			
Epididymis			
Vas deferens			
Ejaculatory duct			

Lecture Quiz



Deduce the effect of epididymitis on male fertility.

Acute **epididymitis** is a result of **sexually transmitted infections** such as gonorrhea -----intrascrotal pain and tenderness. Persistent inflammation of the epididymis, such as that associated with **gonorrhea** infections, includes massive invasion by leukocytes, stimulating fibrosis that obstructs the epididymis and is a common cause of **male infertility**.

SUGGESTED TEXTBOOKS



- 1. Mescher A (2021): Junqueira's Basic Histology, Text and Atlas. 16th Edition. Lange medical books/Mc Graw-Hill.**
- 2. Michael H. Ross and Wojciech Pawlina (2016): Histology A Text and Atlas:, 7th edition.**

THANK

YOU